Contents

Preface vii
Contents xi

Section 1. Vaporization

The high-temperature vaporization/decomposition of actinide materials: fundamental and technological aspects, *R.G. Haire* 1
Vaporization features of oxide systems studied by high-temperature mass spectrometry, *V. Stolyarova* 7
Sweep gas chemistry effect on lithium transport from ceramic breeder blanket materials, *M. Yamawaki, A. Suzuki, M. Yasumoto and K. Yamaguchi* 11
Investigation of vaporization thermodynamics of $SrUO_3$ by means of mass spectrometry, *J. Huang, M. Yamawaki, K. Yamaguchi, M. Yasumoto, H. Sakurai and Y. Suzuki* 17
Laser induced vaporization mass spectrometric studies on UO_2 and graphite, *M. Joseph, N. Sivakumar, D.D.A. Raj and C.K. Mathews* 21
Vaporisation studies on tellurium dioxide: A Knudsen effusion mass spectrometric study, *T.S. Lakshmi Narasimhan, R. Balasubramanian, S. Nalini and M. Sai Baba* 28
Vaporization behavior of neptunium mononitride, *K. Nakajima, Y. Arai and Y. Suzuki* 33
Vapor pressure measurements of La–Gd alloys, *Y. Shoji, T. Matsui, K. Nakamura and T. Inoue* 37
Thermodynamic properties of the UO_2–ZrO_2 system studied by the isothermal mass spectrometric vaporization method, *V. Stolyarova, A. Shilov and M. Shultz* 41

Section 2. Fission products behavior

Distribution of molybdenum in FBR fuel irradiated to high burnup, *I. Sato, H. Furuya, K. Idemitsu, T. Arima, K. Yamamoto and M. Kajitani* 46
Migration behavior of palladium in uranium dioxide, *M. Yoneyama, S. Sato, H. Ohashi, T. Ogawa, A. Ito and K. Fukuda* 50
Phase relations and distribution of fission products in the Pu rock-like fuels with fluorite, spinel and corundum phases, *N. Nitani, H. Yokoi, T. Yamashita, T. Ohmichi, T. Matsui and T. Muromura* 59

Section 3. Basic properties

Thermochemistry of IVA transition metal–oxygen solid solutions, *T. Tsuji* 63
High temperature phase transitions of $CaTiO_3$ and $(Ca_{0.85}Nd_{0.15})TiO_3$ by X-ray diffractometry and differential thermal analysis, *T. Matsui, H. Shigematsu, Y. Arita, Y. Hanajiri, N. Nakamitsu and T. Nagasaki* . . . 72
Recovery behavior of thermal conductivity in irradiated UO_2 pellets, *M. Amaya and M. Hirai* 76
An investigation of the thermal conductivity of Cs_2MoO_4, *T. Ishii and T. Mizuno* 82
Investigation of thermodynamic properties of molten rare earth trichlorides by molecular dynamics method, *Y. Okamoto, H. Hayashi and T. Ogawa* 86
Thermal expansion of neptunium–uranium mixed oxides, *T. Yamashita, N. Nitani, T. Tsuji and T. Kato* 90
Heat capacity measurements on $CaTiO_3$ doped with Ce and La, *Y. Arita, K. Nagarajan, T. Ohashi and T. Matsui* 94
Study on order–disorder transition of Hf–O alloys (O/Hf = 0.11 − 0.22) by heat capacity measurement, *T. Kato and T. Tsuji* 98

Section 4. Reactor fuel behavior and processing

Phase equilibria in the UO_2–austenitic steel system up to 3000°C, *H. Kleykamp* 103
Polygonization and high burnup structure in nuclear fuels, *Hj. Matzke and M. Kinoshita* 108
The stoichiometry and the oxygen potential change of urania fuels during irradiation, *K. Park, M.-S. Yang and H.-S. Park* 116
Specific heat of UO_2-based SIMFUEL, *Hj. Matzke, P.G. Lucuta, R.A. Verrall and J. Henderson* 121
Formation of uranium and cerium nitrides by the reaction of carbides with NH_3 and N_2/H_2 stream, *T. Nakagawa, H. Matsuoka, M. Sawa, M. Hirota, M. Miyake and M. Katsura* 127
High temperature steam oxidation of UO_2 fuel pellets, *M. Imamura and K. Une* 131
Effect of external restraint on bubble swelling in UO_2 fuels, *S. Kashibe and K. Une* 138
Preparation of lanthanide nitrides by carbothermic reduction using ammonia, *T. Nakagawa, H. Matsuoka, M. Sawa, K. Idehara and M. Katsura* 147
Thermodynamics of carbothermic synthesis of actinide mononitrides, *T. Ogawa, Y. Shirasu, K. Minato and H. Serizawa* 151
Thermodynamic studies of uranium–gadolinium–carbon system through the carbothermic reduction of the oxides, *R. Vidhya, M.P. Antony and P.R. Vasudeva Rao* . 158

Section 5. Back end and fuel cycle

Transpiration studies on the volatilities of $PuO_3(g)$ and $PuO_2(OH)_2(g)$ from $PuO_2(s)$ in the presence of steam and oxygen and application to plutonium volatility in mixed-waste thermal oxidation processors, *O.H. Krikorian, A.S. Fontes Jr., B.B. Ebbinghaus and M.G. Adamson* 161
Thermochemistry of lanthanum, neodymium, samarium and americium trihydroxides and their relation to the corresponding hydroxycarbonates, *L. Merli, B. Lambert and J. Fuger* 172
Light element thermodynamics related to actinide separations, *I. Johnson and C.E. Johnson* 177
Actinides recovery from molten salt/liquid metal system by electrochemical methods, *M. Iizuka, T. Koyama, N. Kondo, R. Fujita and H. Tanaka* 183
Identification of oxide phase and alloy phase obtained by heat treatment of calcined high level liquid waste with TiN reducing agent at 1873 K, *M. Uno, H. Kinoshita, C. Miyake and M. Horie* 191
Equilibrium distributions of actinides and lanthanides in molten chloride salt and liquid zinc binary phase system, *H. Moriyama, H. Yamana, S. Nishikawa, Y. Miyashita, K. Moritani and T. Mitsugashira* 197
Temperature effect on technetium(VII) extraction by CMPO and TBP, *M. Takeuchi, S. Tanaka and M. Yamawaki* 203

Section 6. Metals and alloys

Pb–17Li and lithium: A thermodynamic rationalisation of their radically different chemistry, *P. Hubberstey* . . . 208
Thermochemical modeling of actinide alloys related to advanced fuel cycles, *T. Ogawa, M. Akabori, F. Kobayashi and R.G. Haire* 215
Heat capacity and phase transition of Zircaloy-4, *T. Terai, Y. Takahashi, S. Masumura and T. Yoneoka* 222
Electrodeposition of uranium in stirred liquid cadmium cathode, *T. Koyama, M. Iizuka, N. Kondo, R. Fujita and H. Tanaka* 227
Thermodynamic study on UPd_3 and $U(Pd_{0.85}Rh_{0.15})_3$, *Y. Arita, N. Sasajima and T. Matsui* 232
Enthalpies of formation of $CeNi_2$ and $CeNi_5$ by calorimetry, *B. Prabhakara Reddy, R. Babu, K. Nagarajan and P.R. Vasudeva Rao* 235
An X-ray diffraction study of the Np–Ni system, *M. Akabori, R.G. Haire, J.K. Gibson, Y. Okamoto and T. Ogawa* 240
Influence of interstitial oxygen and nitrogen on hydrogen solubility in vanadium, *S. Yamanaka, Y. Kashiwara, H. Sugiyama and M. Katsura* 244
Heat capacity measurements of V–Ti–Cr ternary alloys, *T. Suzuki and T. Matsui* 249
High-temperature reaction of $(U, Gd)O_2$ with zirconium, *S. Yamanaka, K. Tsujimoto, T. Yamanaka, M. Uno, M. Miyake and M. Katsura* 252

Section 7. Oxide systems

Thermodynamics of the U–O and Zr-systems and application to analysis of fuel liquefaction during severe accidents in light water reactors, *D.R. Olander and W.-E. Wang* 258
Characteristic thermodynamic properties of $M_yU_{1-y}O_{2+x}$ ($M = M^{4+}$, M^{3+} and M^{2+}; $x \gtreqless 0$) solid solutions and the phase behavior of Mg solid solution in low oxygen pressures, *T. Fujino, N. Sato and K. Yamada* 265
Studies on the oxygen potentials of $(U_yTh_{1-y})O_{2+x}$ solid solutions, *S. Anthonysamy, K. Nagarajan and P.R. Vasudeva Rao* 273
Thermodynamics and phase equilibria of the system Ru–Te–O, *G. Chattopadhyay, S. Vana Varamban and S.R. Bharadwaj* 277
An electrochemical investigation of the thermodynamic properties of $Na_2Mo_2O_7$ and Na_2NiO_2, *T. Mathews, D. Krishnamurthy and T. Gnanasekaran* 280
Phase equilibria of $CaTiO_3$ doped with Ce, Nd and U, *Y. Hanajiri, H. Yokoi, T. Matsui, Y. Arita, T. Nagasaki and H. Shigematsu* 285
Study of the thermodynamic properties of $(U, Ce)O_2$, *K. Yamada, S. Yamanaka, T. Nakagawa, M. Uno and M. Katsura* 289

Section 8. Properties of other compounds

Phase diagram calculations of the U–Pu–N system with carbon and oxygen impurities, *D.D. Sood, R. Agarwal and V. Venugopal* 293
Regularities of phase equilibria in the binary uranium tetrachloride systems and their thermodynamic interpretation, *W. Gaweł* 301
Phase equilibria of $NdCl_3$–NaCl–KCl, *Y. Hosoya, T. Terai, S. Tanaka and Y. Takahashi* 304
Thermal analysis of pseudo-binary system: LiCl–KCl eutectic and lanthanide trichloride, *K. Nakamura and M. Kurata* 309
Study on the hydrogen solubility in zirconium alloys, *S. Yamanaka, M. Miyake and M. Katsura* 315
Reactions of uranium nitride with platinum-family metals, *M. Uno, K. Kurosaki and A. Nakamura* 322
Study on the Nb–O–H ternary system, *S. Yamanaka, Y. Sannomiya, T. Minamiguchi and M. Katsura* 328
Hydrogen desorption properties of hydrogenated U–Th–Zr alloys, *H. Suwarno, T. Yamamoto, F. Ono, K. Yamaguchi and M. Yamawaki* 333
Development of new reactor fuel materials: hydrogenation properties of U–Th–Zr alloys and neutron irradiation effects on their hydrides, *T. Yamamoto, H. Suwarno, H. Kayano and M. Yamawaki* 339
Heat capacity measurement of $(Cr_{1-x}Fe_x)_3Te_4$ ($x = 0$–0.1) at high temperatures, *K. Yasui, K. Ishida and T. Tsuji* 345

Author index 349
Subject index 353